

REMARKS

Interview Summary

A phone interview was conducted with the Examiner on February 4, 2009. The 35 USC § 102(b) rejections of claims 1 and 14 were discussed. During the discussion, misunderstandings of the prior art and Applicants' claimed invention became evident. In particular, aspects of claim 10 in cited art to Bottomley and aspects of Applicant's claim 14 were not clearly understood by the Examiner. The Examiner invited the Applicant to submit an after-final Response to clarify differences between the cited art and Applicants' invention as claimed in claims 1 and 14. Accordingly, Applicants respectfully set forth the clarifications below.

Status of the Claims

Claims **1-5, 9-17, 19-20, 22, 23, 25-29, 33-38, 40, 42, 43, 45, 46** and **48** were presented for examination. In the Office Action, claims 1, 2, 4, 5, 8-11, 21, 23, 24, 27, 28 and 39-44 were rejected under 35 USC 102(b) as allegedly anticipated by U.S. Patent 5,506,861 to Bottomley (hereafter "Bottomley"). Claims 14-17, 19, 20, 22, 23, 25, 37, 38, 40, 42, 43, 45, 46 and 48 were rejected under 35 USC 102(b) as allegedly anticipated by U.S. Patent 5,790,588 to Fukawa *et al.* (hereafter "Fukawa"). Claim 3 was rejected under 35 USC 103(a) as allegedly being unpatentable over Bottomley in view of admitted art (paragraph 0004 of the application). Claims 12, 13, 35, and 36 were rejected under 35 USC 103(a) as allegedly being unpatentable over Bottomley in view of U.S. Patent 6,317,612 to Farsakh (hereafter "Farsakh"). Claims 14, 15, 16, 17, 19, 20, 22, 23, 25, 37, 38, 40, 43 and 46 stand provisionally rejected under nonstatutory obviousness-type double patenting in view of claims 13, 13, 16, 15, 16, 17, 18, 19, 20, 31, 31, 33, 35 and 37 respectively of Applicant's co-pending application No. 09/788,890.

In this Response, claims 4, 9, 14, 16, 17, 20, 23, 35, 37, 40, 42, 43, and 46 are amended. Claims 13, 15, 19, 22, 25, 29, 34, 36, 38, 45, and 48 are cancelled. New claims 49-55 are added. Amendments have been made to more clearly define the invention. Support for the amendments and newly added claims can be found throughout the specification and at least at pages 4, lines 3-6, pages 8, lines 21-26, page 7, line 26 – page 8, line2, page 12, lines 10-26, and page 14, lines 1-18. Applicants note that amendments to claims 16, 17, 40 and 42 place these claims in independent form, bringing the total number of independent claims to eight. These amendments were necessitated by amendment to base claim 14. The total number of pending claims is 31.

Upon entry of this Response, claims **1-5, 9-12, 14, 16, 17, 20, 23, 26-28, 33, 35, 37, 40, 42, 43, 46, and 49-55** will be presented for examination.

35 USC 102(b) Rejections: Claims 1, 2, 4, 5, 8-11, 21, 23, 24, 27, 28 and 39-44

In the Office Action, claims 1, 2, 4, 5, 8-11, 21, 23, 24, 27, 28 and 39-44 were rejected under 35 USC 102(b) as allegedly anticipated by Bottomley. Applicants note that pending claims 23, 40, 42 and 43 do not pertain to base claims 1 or 27 cited in this rejection, and respectfully requests these claims be omitted from this rejection or that all elements of these claims be identified in Bottomley.

During the phone interview, the Examiner relied primarily on claim 10 of Bottomley and cited column 16, lines 34-36 of Bottomley as allegedly disclosing each and every element of Applicants' claim 1. Applicants' representative noted during the interview that claim 10 of Bottomley did not describe the same apparatus as claimed by Applicants. In particular, Bottomley's receiver of claim 10 recites means for decorrelating the CDMA signal using the "selected" correlations and channel tap coefficients. Applicants' invention does not decorrelate the CDMA signal with selected correlations and tap coefficients, but rather produces a substantially uncorrelated output **x** (second vector output) by operating on the plurality of outputs **a** (first vector output) from the bank of correlators. (See Applicants' FIG. 1.) Applicants' step of transforming **a** to **x** does not use "selected" correlations and estimated channel tap coefficients, but rather uses all correlation values from the bank of correlators and a matrix transformation, e.g. as defined in claims 49-55, to produce a substantially uncorrelated second vector output as claimed. Applicants note that a general step of decorrelating signals does not necessarily produce an uncorrelated output. Decorrelation generally reduces correlation among signals, but does not necessarily produce uncorrelated results. A definition of decorrelation can be found at <http://en.wikipedia.org/wiki/Decorrelation>: "**Decorrelation** is a general term for any process that is used to reduce autocorrelation within a signal, or cross-correlation within a set of signals, while preserving other aspects of the signal." Applicants submit that producing a substantially uncorrelated output is not disclosed by Bottomley.

There are additional differences between Bottomley's apparatus and Applicants' claimed invention. Bottomley's receiver has means for selecting one of the plurality of correlations for each signal ray of each of the CDMA signals. Applicants' claimed invention does not select one

of a plurality of correlations. All correlations are used in the signal processing in Applicants' claimed invention as claimed in claim 1. Bottomley's claimed receiver has means for estimating multipath channel tap coefficients. Applicants' invention of claim 1 does not estimate channel tap coefficients.

Additionally, Applicants' invention as claimed in claim 1 produces a substantially uncorrelated output when random noise is present in the received signal. Bottomley has only addressed the case of multipath distortion, *i.e.* echos of signals due to reflection. Bottomley further indicates that noise is omitted from the analysis which the Examiner has cited as anticipatory art. (Column 14, lines 34-46. Note that the noise term $n(k)$ is removed from the expression for the received signal $R(k)$. Compare with the equation at column 8, line 21 which includes the noise term.) Applicants submit that Bottomley's receiver cannot produce a substantially uncorrelated output when random noise is present on the received signal. This was pointed out during the Examiner interview.

The Examiner also indicated that Bottomley's discussion of minimum mean square estimation techniques (MMSE) at column 16, lines 34-36 is anticipatory of Applicants' claim 1. Applicants submit that all implementations of MMSE techniques are not the same. Bottomley's implementation is for an embodiment of a receiver as described in the section of the patent beginning at column 14 line 6 and ending at column 16 line 47. Bottomley teaches that his MMSE technique requires adding a value proportional to the noise power to certain cross-correlation terms C_{x_i, y_p} assuming white noise having a flat spectrum. Applicants' implementation of MMSE techniques involves minimizing the squared error between the first and second vector output, *i.e.* between the output from the correlators **a** and the substantially uncorrelated output **x**. Further, Applicants' MMSE technique requires no knowledge about the noise to produce a substantially uncorrelated output, a significant advantage of Applicants' claimed invention. Applicants submit that the differences in the MMSE technique alone establish that Bottomley does not anticipate Applicants' claimed invention.

Applicants submit that the differences noted above more clearly show that Bottomley does not disclose each and every element of Applicants' claims 1 and 27. Applicants remind the Examiner that when ascertaining differences between alleged prior art and the claimed invention, the claim language is to be interpreted as a whole and in view of the specification, and both the alleged prior art and the invention are to be considered as a whole. For Applicants' claims 1 and

27, Bottomley does not disclose an apparatus that produces an uncorrelated output or utilize the MMSE technique as set forth and claimed by Applicants. For at least the above reasons, Applicants request reconsideration and withdrawal of the rejection of pending claims 1, 2, 4, 5, 9-11, 23, 27, 28, 40, 42, and 43 under 35 USC 102(b).

35 USC 102(b) Rejections: Claims 14-17, 19, 20, 22, 23, 25, 37, 38, 40, 42, 43, 45, 46 and 48

In the Office Action, claims 14-17, 19, 20, 22, 23, 25, 37, 38, 40, 42, 43, 45, 46 and 48 were rejected under 35 USC 102(b) as allegedly anticipated by Fukawa. During the phone interview, it became known that the Examiner misunderstood Applicants' claimed "set of signals." In the Office Action dated October 10, 2008 (page 4), the Examiner identified the set of signals as identical to the set of signature signals. Applicant's representative explained during the phone interview that the claimed "set of signals" were distinct from the signature signals.

Applicants have amended claim 14 and related claims 16, 17, 20, 23, 37, 40, 42, 43 and 46 to more clearly define the claimed invention. In the amendments the limitation of claim 15 has been included in claim 14. These claims are directed to the embodiment depicted in FIG. 2. Applicants' invention as claimed in independent claims 14, 16, 17, 37, 40, and 42 is directed to correlating received signals with a particular set of "correlating" signals. (Denoted $h_m(t)$ in FIG. 2.) The set of correlating signals are determined by minimizing the least-squares error between the set of correlating signals and either a set of signature signals (claims 14, 17, 37, and 40) or between the set of correlating signals and a set of decorrelator signals $v_m(t)$ (claims 16 and 42). Fukawa does not disclose a minimization of least-squares error between correlating signals and signature signals or decorrelator signals as claimed by Applicants. Applicants' correlating signals are not the same as the signature signals, e.g., the correlating signals are orthogonal and the signature signals are non-orthonormal. Applicants have identified and claim particular correlating signals which improve detection of a received signal when noise is present.

Applicant notes that Fukawa at column 19, lines 43-67 cited by the Examiner discloses minimizing error signals e_1 and e_2 . These error signals are clearly shown in FIG. 20 of Fukawa, and represent a difference between a correlation output and a threshold detection output from the same correlation output. The error signals are then used to modify tap coefficients (within \mathbf{W}_1 and \mathbf{W}_2 sent to the correlators 32C₁ and 32C₂). This disclosure differs from Applicants' claimed invention as described above and does not disclose what Applicants claim, i.e. reducing a least

squares error between correlating signals and specific sets of signals. Again, Applicants submit that not all least-squares error embodiments are the same, and the Examiner has not ascertained the differences between Fukawa and Applicants' claimed invention.

Applicants submit that the differences noted above more clearly show that Fukawa does not disclose each and every element of Applicants' claims 14 and related claims. For at least the above reasons, Applicants request reconsideration and withdrawal of the rejection of pending claims 14, 16, 17, 20, 23, 37, 40, 42, 43, and 46 under 35 USC 102(b) to the extent the rejection is maintained against the amended claims.

CONCLUSION

In view of the above, Applicant submits that presently pending claims **1-5, 9-12, 14, 16, 17, 20, 23, 26-28, 33, 35, 37, 40, 42, 43, 46, and 49-55** are in condition for allowance and early indication thereof is respectfully requested. If the Examiner believes a phone call will expedite prosecution of this case, the Examiner is invited to call the undersigned at 617 248-5143.

Respectfully submitted,
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